

## [12] 实用新型专利说明书

[21] 专利号 01260005.9

[45] 授权公告日 2002 年 9 月 4 日

[11] 授权公告号 CN 2509675Y

[22] 申请日 2001.9.19

[21] 申请号 01260005.9

[73] 专利权人 林锡煌

[74] 专利代理机构 永新专利商标代理有限公司

地址 中国台湾

代理人 徐 纲

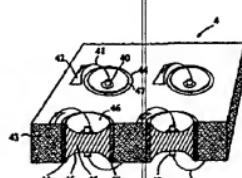
[72] 设计人 林锡煌

权利要求书 1 页 说明书 4 页 附图页数 2 页

[54] 实用新型名称 具两面发光的发光二极管显示器

[57] 摘要

一种具两面发光的发光二极管显示器，包括：发光二极管晶粒、一个印刷电路板、反射面、导电件；印刷电路板上设有至少一个貫孔；具有至少一个导电件，其分别穿设于貫孔中，各导电件的两端分别延伸至印刷电路板的上、下两面，并分别形成有一个凹弧状反射面；数个发光二极管晶粒分别固着在印刷电路板上、下面的各凹弧状反射面的底部，各发光二极管晶粒的一个电极与相对应的导电件接驳，另一个电极与印刷电路板上的电路接点接驳。貫孔的壁面镀有一导电层，导电件经由导电层与印刷电路板上的电路电连接。印刷电路板及发光二极管晶粒被固态的环氧树脂封装。本显示器可以两面发光。



ISSN 1008-4274

## 权 利 要 求 书

1、一种具两面发光的发光二极管显示器，包括：发光二极管晶粒、一个印刷电路板、反射面、导电件，其特征在于：

印刷电路板上设有至少一个貫孔；

具有至少一个导电件，其分别穿设于上述貫孔中，各导电件的两端分别延伸至印刷电路板的上、下两面，并分别形成有一个凹弧状反射面；

数个发光二极管晶粒分别固着在印刷电路板上、下面的各凹弧状反射面的底部，各发光二极管晶粒的一个电极是与相对应的导电件导接，另一个电极与印刷电路板上的电路接点导接。

2、根据权利要求1所述的具两面发光的发光二极管显示器，其特征在于：所述印刷电路板上貫孔的壁面镀有一导电层，所述穿设于貫孔中的导电件经由导电层与印刷电路板上的电路形成电连接。

3、根据权利要求1或2所述的具两面发光的发光二极管显示器，其特征在于：所述印刷电路板及发光二极管晶粒被固态的环氧树脂封装。

## 说 明 书

## 具两面发光的发光二极管显示器

## (一)技术领域:

本实用新型涉及一种发光二极管显示器，特别是涉及一种具两面发光的发光二极管显示器。

## (二)背景技术:

如图 1 所示，一般的发光二极管晶粒 1 是一种大小约 0.3 立方毫米的晶粒，其具有一个正(P)极区 11 及一个负(N)极区 12，而在其四个侧面构成一个 P-N 接合面(正负离子结合面)，也就是所谓的发光区，且在晶粒 1 的上表面设有一个连接垫 13。因此，为使发光二极管晶粒 1 发光的光线能够集中反射至同一正面，必须在发光二极管晶粒 1 的四周围绕形成一个碗状反射面，所以该碗状反射面是发光二极管显示器的必要构件。

如图 2 所示，其为现有市面上可见的一种发光二极管显示器 2，俗称发光二极管。其具有两支不相连的金属支架 20、21，其中支架 20 的顶端设有一个碗状反射面 25，一个发光二极管晶粒 22 放置在碗状反射面 25 的底部，并经由导线 23 连接至另一个支架 21，然后再以环氧树脂 24 包覆。因此，当以此元件组合成一个发光二极管显示面板时，必须一个一个地插设在一个大型基板上，不但插件费时费工，而且发光二极管很难被固定在同一方向，容易造成显示画面的亮度不均现象。

如图 3 所示，其是现有另一种发光二极管显示器 3，俗称点矩阵发光二极管显示器，其具有一个印刷电路板 30 及一个设有多个碗状反射面 34 的塑料套件 35，该印刷电路板 30 上设有多个发光二极管晶粒 32，并各经由一个导线 33 与印刷电路板上的电路接点连接，而该塑料套件 35 上的该等碗状反射面 34 对应围设在各发光二极管晶粒

32 的周围，并与印刷电路板 30 结合，然后，以固态的环氧树脂 31 添满其间的空隙。此种发光二极管显示器 3 虽易于组合成显示面板，但由于其碗状反射面是由塑料(防止与印刷电路板短路)制成，反光效果并不如前述发光二极管 2 的金属碗状反射面 25。

此外，以上所述的两种发光二极管显示器皆不具有两面发光的功能，因此，若需要进行双面发光显示时，现有的作法是直接将两块发光二极管显示器面板背贴背组设在一起，然而，这样的作法不但无法节省电路基板材料的成本，而且还要增加一道组装手续。

(三)发明内容：

本实用新型的目的在于提供一种便于制造的具两面发光的发光二极管显示器。

为达到上述目的，本实用新型采取如下技术措施：

本实用新型的具两面发光的发光二极管显示器的特征在于：其包括有一个设有至少一个贯孔的印刷电路板、至少一个导电件及数个发光二极管晶粒。导电件分别穿设于印刷电路板的各贯孔内，且其延伸至印刷电路板上、下面的两端，并分别形成一个凹弧形反射面。发光二极管晶粒分别固着在各凹弧形反射面的底部，且其一个电极与各导电件导接，另一电极与印刷电路板连接，这样，可达到两面发光的目的。

本实用新型的具体结构可叙述如下：

本实用新型的具两面发光的发光二极管显示器，包括：发光二极管晶粒、一个印刷电路板、反射面、导电件；

印刷电路板上设有至少一个贯孔；

具有至少一个导电件，其分别穿设于上述贯孔中，各导电件的两端分别延伸至印刷电路板的上、下面，并分别形成有一个凹弧状反射面；

数个发光二极管晶粒分别固着在印刷电路板上、下面的各凹弧状反射面的底部，各发光二极管晶粒的一个电极是与相对应的导电件导

接，另一个电极与印刷电路板上的电路接点导接。

其中：所述印刷电路板上贯孔的壁面镀有一导电层，所述穿设于贯孔中的导电件经由导电层与印刷电路板上的电路形成电连接。

其中：所述印刷电路板及发光二极管晶粒被固态的环氧树脂封装。

与现有技术相比，本实用新型具有如下效果：

1. 本实用新型利用在一个印刷电路板的贯孔中插设一延伸至印刷电路板两面的导电件，并在导电件的两端形成一个凹弧形反射面供发光二极管晶粒固着于底部，而在一印刷电路板上组成一个可两面发光的发光二极管显示器，不但能节省以往使用两面发光显示时需用到两块电路板的材料成本，而且可简化制作两面发光二极管显示器的工艺。

2. 由于本实用新型是在印刷电路板上贯设导电件，并于导电件的两端形成凹弧状反射面，使发光二极管晶粒易于组设固着在同一块印刷电路板上，使显示器画面的亮度能够均匀，而且该凹弧状反射面是一金属反射面，具有较佳的反光效果，因此，能够改善前述两种发光二极管显示器插件费时费工、亮度不均以及反光效果不佳等缺点。

归纳上述，本实用新型具两面发光的发光二极管显示器借由在一个印刷电路板上设置至少一个连通该印刷电路板两面的导电件，并在导电件两端分别形成凹弧状反射面供一个发光二极管晶粒固着于底部，而达到可两面发光及节省材料成本与制造工艺的效果，确实具有实用性。

#### 四附图说明：

图 1：一般发光二极管晶粒的立体图。

图 2：现有一种发光二极管显示器的立体图。

图 3：现有另一种点矩阵发光二极管显示器的立体剖视图。

图 4：本实用新型具两面发光的发光二极管显示器实施例的立体剖视图。

## (5) 具体实施方式：

结合附图及实施例对本实用新型的结构特征详细说明如下：

如图 4 所示，其表示本实用新型具两面发光的发光二极管显示器 4 的一实施例，显示器 4 包括有一个印刷电路板 43、数个导电件 45 及数个发光二极管晶粒 40。

印刷电路板 43 上贯穿设有多个电路贯穿孔 44，各贯穿孔 44 的壁面镀有一与印刷电路板 43 上的电路导接的导电层 47。

导电件 45 是一金属柱状体，其分别穿设于上述印刷电路板 43 的各贯穿孔 44 中，而利用贯穿孔 44 壁面的导电层 47 与印刷电路板 43 上的电路导接，且其上、下两端分别延伸至印刷电路板 43 的上、下面并分别形成有一个凹弧状(或称碗状)反射面 46。

发光二极管晶粒 40 分别设置并固着在印刷电路板 43 上的各导电件 45 的凹弧状反射面 46 的底部，发光二极管晶粒 40 的一个电极与相对应的导电件 45 导接，而其另一个电极则经由一个导线 41 与印刷电路板 43 上的电路接点 42 连接。

最后，以环氧树脂(图中未示)将印刷电路板 43 及发光二极管 40 包覆，即构成一个可两面发光的发光二极管显示器 4 的成品。

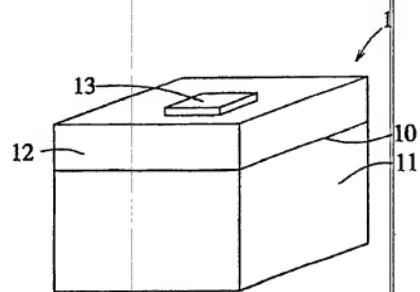


图 1

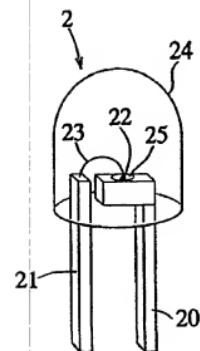


图 2

01-09-29

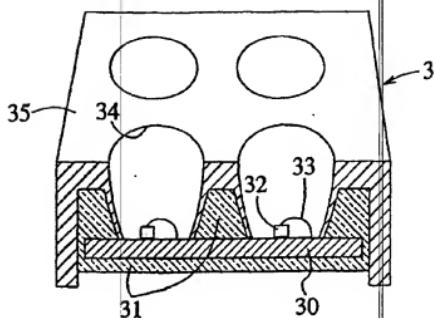


图 3

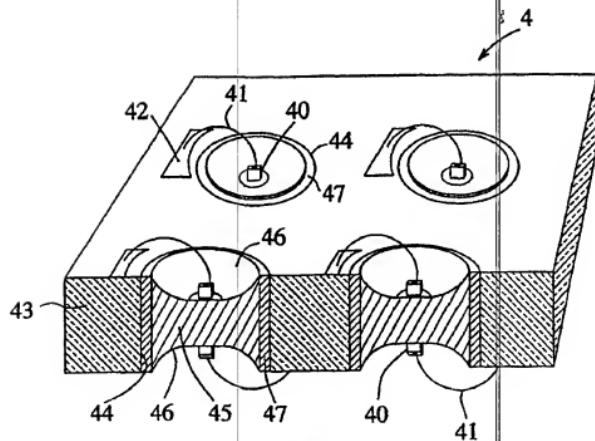


图 4

### **Light-emitting diode display with double-side illumination**

#### **(I) Technical Field**

This utility model relates to a light-emitting diode display, in particular to light-emitting diode display with double-side illumination.

#### **(II) Background Art**

As shown in Fig. 1, a common light-emitting diode grain 1 is a grain of about 0.3 mm<sup>3</sup>, which has a positive (P) pole area 11 and a negative (N) pole area 12, and a P-N joint surface (a junction plane of positive and negative ions), which is the so-called light-emitting area, is formed on each of the four sides thereof, and a connection pad 13 is formed on the upper surface of grain 1. Thus in order to make the light emitted by the light-emitting diode grain 1 reflected on the same surface, a bowl-shaped reflection surface has to be formed to wind around the light-emitting diode grain 1, so said bowl-shaped reflection surface is a necessary component of the light-emitting diode display.

A light-emitting diode display 2 as available in market is shown in Fig. 2, and it is called light-emitting diode. It has two metal supports 20 and 21 which are not connected to each other, wherein a bowl-shaped reflection surface 25 is provided on the top of support 20, a light-emitting diode grain 22 is placed at the bottom of the bowl-shaped reflection surface 25 and is connected to another support 21 through wire 23, then it is wrapped by epoxy resin 24. Therefore, when using these elements to compose the display panel of a light-emitting diode, they have to be

inserted on a large-sized substrate one by one, and this is not only time-consuming and labor-consuming, but it is hard to fix the light-emitting diode in the same direction, thus causing non-uniformity of the brightness of the displayed picture.

Another available light-emitting diode display 3 is shown in Fig. 3, which is called dot matrix light-emitting diode display having a printed circuit board 30 and a plastic cover 35 having a plurality of bowl-shaped reflection surfaces 34 provided thereon. A plurality of light-emitting diode grains 32 are provided on the printed circuit board 30, and they are each connected to the circuit contacts on the printed circuit board through a wire 33, the bowl-shaped reflection surface 34 on the plastic cover 35 is surrounding the light-emitting diode grains 32 and is combined to the printed circuit board 30, then the gaps are filled with solid-state epoxy resin 31. Although such kind of light-emitting diode display 3 can be easily used for composing the display panel, since the bowl-shaped reflection surface thereof is made of plastic (for preventing short-circuiting with the printed circuit board), the light-reflection effect thereof is not as good as that of the metal bowl-shaped reflection surface 25 of the previously mentioned light-emitting diode 2.

In addition, neither of the above-mentioned two kinds of light-emitting diode displays has the function of double side illumination, so when there is the need for double side illuminating and displaying, a common practice is to assemble the panels of two light-emitting diode displays to each other back to back, but such a way cannot save the cost for the material of circuit base plate, and it requires a process of assembling.

### (III) Summary of the Invention

The present utility model is directed at providing a light-emitting diode

display with double side illumination that can be easily fabricated.

In order to achieve this object, the present utility model adopts the following technical means:

The light-emitting diode display with double side illumination according to the present utility model is characterized in that it comprises a printed circuit board having at least one via hole, at least one conductive member and a plurality of light-emitting diode grains. The conductive members pass through the via holes of the printing circuit board and extend to the two ends of the upper and lower surfaces of the printed circuit board to respectively form reflection surfaces with the shape of arcs of recesses. The light-emitting diode grains are adhered to the bottom of the reflection surfaces with the shape of arcs of recesses, and one electrode thereof is electrically connected to each of the conductive members, and another electrode thereof is connected to the printed circuit board to achieve double side illumination.

The specific structure of the present utility model can be described as follows:

The light-emitting diode display with double side illumination according to the present utility model comprises light-emitting diode grains, a printed circuit board, a reflection surface and a conductive member; at least one via hole is provided on the printed circuit board; at least one conductive member passes through said via holes, the two ends of each conductive member extend to the upper and lower surface of the printed circuit board to respectively form reflection surfaces with the shape of arcs of recesses; a plurality of light-emitting diode grains are adhered to the bottom of the reflection surfaces with the shape of arcs of recesses on the upper and

lower surfaces of the printed circuit board, one electrode of each of the light-emitting diode grain is electrically connected to the corresponding conductive member and the other electrode is electrically connected to the circuit contacts on the printed circuit board.

Wherein a conductive layer is plated on the walls of the via holes on the printed circuit board, and the conductive members passing through the via holes is electrically connected to the circuits on the printed circuit board via the conductive layer.

Wherein said printed circuit board and light-emitting diode grains are encapsulated by solid-state epoxy resin.

Compared to the prior art, the present utility model has the following effects:

1. The present utility model forms a light-emitting diode display on a printed circuit board that is capable of double side illuminating by inserting a conductive member extending to the two sides of the printed circuit board into the via holes on the printed circuit board and forming a reflection surface with the shape of arcs of recesses on the two ends of the conductive member so that the light-emitting diode grains could be adhered to the bottom thereof, thus it could not only save the cost for two circuit boards as needed for double side illuminating and display in the past, but also simply the process of fabricating the light-emitting diode display with double side illumination.
2. The present utility model has the conductive members provided penetrating the printed circuit board and forms reflection surfaces with the shape of arcs of recesses on the two ends of the conductive member, so the light-emitting diode grains can be easily adhered to the same printed circuit board to achieve uniform brightness of the picture on the

display; besides, said reflection surface with the shape of arcs of recesses is metal reflection surface, so it has better reflection effect and could overcome the defects of time-consuming and labor consuming in inserting the elements, non-uniform brightness and bad light reflection effect in the previously mentioned two kinds of light-emitting diode displays.

In summary, the light-emitting diode display with double side illumination in the present utility model achieves the effects of double side illumination and saving cost and manufacturing process by means of providing at least one conductive member on a printed circuit board that connects to both sides of the printed circuit board and forming reflection surfaces with the shape of arcs of recesses on both ends of the conductive member so that the light-emitting diode grains can be adhered to the bottom thereof, therefore, it has practical applicability.

#### (IV) Description of the Drawings

Fig. 1: a three-dimensional drawing of a common light-emitting diode grain.

Fig. 2: a three-dimensional drawing of an existing light-emitting diode display.

Fig. 3: a three-dimensional sectional view of another existing dot matrix light-emitting diode display.

Fig. 4: a three-dimensional sectional view of the embodiment of the light-emitting diode display with double side illumination according to the present utility model.

#### (V) Preferred Embodiment

The structural features of the present utility model is explained in detail

below with reference to the drawings and embodiments.

Fig. 4 shows an embodiment of the light-emitting diode display 4 with double side illumination according to the present utility model. The display 4 has a printed circuit board 43, several conductive members 45 and a plurality of light-emitting diode grains 40.

A plurality of circuit via holes 44 are provided penetrating the printed circuit board 43, and the wall of each via hole 44 is plated with a conductive layer 47 that is electrically connected to the circuit on the printed circuit board 43.

The conductive member 45 is a metal column which is provided penetrating the via holes 44 on the printed circuit board 43, and the conductive layer 47 on the walls of the via holes 44 is electrically connected to the circuits on the printed circuit board 43, meanwhile, the upper and lower ends thereof extend to the upper and lower surfaces of the printed circuit board 43 to respectively form a reflection surface 46 with the shape of arcs of recesses (or the shape of a bowl).

The light-emitting diode grains 40 are provided and adhered to the bottom of the reflection surface 46 with the shape of arcs of recesses of the conductive members 45 on the printed circuit board 43, one electrode of the light-emitting diode grain 40 is electrically connected to the corresponding conductive member 45, and another electrode thereof is connected to the circuit contact 42 on the printed circuit board 43 via a wire 41.

Finally, the printed circuit board 43 and light-emitting diode 40 are wrapped by epoxy resin (not shown) to form the finished product of the light-emitting diode display 4 with double side illumination.

What is claimed is:

1. A light-emitting diode display with double side illumination, comprising: light-emitting diode grains, a printed circuit board, a reflection surface and a conductive member, characterized in that at least one via hole is provided on the printed circuit board; at least one conductive member passes through said via holes, the two ends of each conductive member extend to the upper and lower surface of the printed circuit board to respectively form reflection surfaces with the shape of arcs of recesses; a plurality of light-emitting diode grains are adhered to the bottom of the reflection surfaces with the shape of arcs of recesses on the upper and lower surfaces of the printed circuit board, one electrode of each of the light-emitting diode grain is electrically connected to the corresponding conductive member and the other electrode is electrically connected to the circuit contacts on the printed circuit board.
2. The light-emitting diode display with double side illumination according to claim 1, characterized in that a conductive layer is plated on the walls of the via holes on the printed circuit board, and the conductive members passing through the via holes is electrically connected to the circuits on the printed circuit board via the conductive layer.
3. The light-emitting diode display with double side illumination according to claim 1 or 2, characterized in that said printed circuit board and light-emitting diode grains are encapsulated by solid-state epoxy resin.

## Abstract

A light-emitting diode display with double side illumination, comprising: light-emitting diode grains, a printed circuit board, a reflection surface and a conductive member; at least one via hole is provided on the printed circuit board; at least one conductive member passes through said via holes, the two ends of each conductive member extend to the upper and lower surface of the printed circuit board to respectively form reflection surfaces with the shape of arcs of recesses; a plurality of light-emitting diode grains are adhered to the bottom of the reflection surfaces with the shape of arcs of recesses on the upper and lower surfaces of the printed circuit board, one electrode of each of the light-emitting diode grain is electrically connected to the corresponding conductive member and the other electrode is electrically connected to the circuit contacts on the printed circuit board. A conductive layer is plated on the walls of the via holes, and the conductive member is electrically connected to the circuits on the printed circuit board via the conductive layer. The printed circuit board and light-emitting diode grains are encapsulated by solid-state epoxy resin. The display of the present utility model can realize double side illumination.

**Family list**

1 family member for: **CN2509675Y**  
Derived from 1 application

**1 Illuminating diode display device with double-side illuminating**

**Inventor:** LIN XIHUANG (CN)

**Applicant:** LIN XIHUANG (CN)

**EC:**

**IPC:** G09F9/33; G09F9/33; (IPC1-7): G09F9/33

**Publication info:** **CN2509675Y** Y - 2002-09-04

Data supplied from the **esp@cenet** database - Worldwide